

CLAIMS

I claim:

1. A flat plate heat exchanger coil comprising:
 - a body having two opposing side sheets that are substantially smooth, two opposing longitudinal edges and two opposing transverse edges where the two side sheets are sealed to each other along the borders of the two transverse edges and the two longitudinal edges, defining an open interior space;
 - a heat exchange medium inlet nozzle in fluid communication with the open interior space;
 - a heat exchange medium exit nozzle in fluid communication with the open interior space; and
 - at least one flow diverter positioned within the open interior space to create a heat exchange medium flow path.
2. The flat plate heat exchanger coil of claim 1, further comprising:
 - at least one pressure resistor member positioned within the open interior space with one end thereof attached to the interior surface of one side sheet.
3. The flat plate heat exchanger coil of claim 1, further comprising:
 - at least one pressure restraint member positioned within the open interior space.
4. The flat plate heat exchanger coil of claim 1, wherein said at least one flow diverter is a strip of material having at least one bend.
5. The flat plate heat exchanger coil of claim 4, wherein said at least one flow diverter includes at least one hole formed therethrough along the center line

thereof, and said at least one pressure resistor member is received by at least one hole to position and retain said flow diverter within the interior space.

6. The flat plate heat exchanger coil of claim 1, wherein said at least one flow diverter is of a solid bar and is bent to create the heat exchange medium flow path.
7. The flat plate heat exchanger coil of claim 1, wherein said at least one flow diverter is of a hollow section material and is bent to create the heat exchange medium flow path.
8. The flat plate heat exchanger coil of claim 1, wherein said at least one pressure resistor member and said at least one pressure restraint member is strategically positioned within the interior space to aid in the placement and retention of said at least one flow diverter.
9. The flat plate heat exchanger coil of claim 8, wherein said at least one flow diverter is selected from the group consisting of a solid bar, a hollow section material and a strip of material.
10. The flat plate heat exchanger coil of claim 1, wherein said heat exchange medium exit nozzle is attached to a vacuum source and said heat exchange medium inlet nozzle is attached to a source of heat exchange medium.
11. The flat plate heat exchanger coil of claim 1, wherein said at least one flow diverter comprises a plurality of tapered flow diverter strips interlocked with and orthogonal to a plurality of flow control strips, the flow control strips having a plurality of reduced sections formed therealong so as to be spaced between adjacent tapered flow diverter strips.

12. The flat plate heat exchanger coil of claim 1, wherein said at least one flow diverter is strip of material formed in a serpentine shape and includes a heat exchange medium flow control leg.
13. The flat plate heat exchanger coil of claim 1, wherein said at least one flow diverter is a strip of material having opposed edges bent orthogonal to the side sheets and a diagonal web extending between the opposed bent edges thereof.
14. The flat plate heat exchanger coil of claim 1, wherein said at least one flow diverter is a corrugated formed sheet of material.
15. The flat plate heat exchanger coil of claim 1, further comprising:
at least one support lug extending from one edge of said body.
16. The flat plate heat exchanger coil of claim 1, further comprising:
at least one indentation formed into one edge of said body.
17. The flat plate heat exchanger coil of claim 1, further comprising:
at least one lifting lug extending from the top of said body.
18. The flat plate heat exchanger coil of claim 1, further comprising:
at least one location lug extending from one edge of said body.
19. The flat plate heat exchanger coil of claim 1, wherein said body includes at least one support hole formed through the side sheets thereof.
20. The flat plat heat exchanger coil of claim 1, wherein said body has a thickness that decreases from one transverse edge to the second transverse edge.

21. The flat plate heat exchanger coil of claim 20, wherein the thickness of said body decreases from one transverse edge to the second transverse edge in a series of steps.
22. The flat plate heat exchanger coil of claim 21, wherein the series of steps are created by overlapping sections of sheet material to form the two opposing sides thereof.
23. The flat plate heat exchanger coil of claim 21, wherein the series of steps are created by forming inward facing bends at spaced locations along each side sheet.
24. The flat plate heat exchanger coil of claim 1, wherein said body has a width that increases from one transverse edge to the second transverse edge.
25. A bulk material heat exchanger comprising:
a plurality of flat plate heat exchanger coils arranged side-by-side in a spaced relationship, each said flat plate heat exchanger coil having a body with two opposing side sheets that are substantially smooth, two opposing longitudinal edges and two opposing transverse edges where the two side sheets are sealed to each other along the borders of the two transverse edges and the two longitudinal edges, defining an open interior space, a heat exchange medium inlet nozzle in fluid communication with the interior space, a heat exchange medium exit nozzle in fluid communication with the open interior space, at least one flow diverter positioned within the open interior space to create a heat exchange medium flow path;
a heat exchange medium supply manifold attached to each heat exchange medium inlet nozzle of each flat plate heat exchanger coil, said heat

exchange medium supply manifold attached to a heat exchange medium supply system; and

a heat exchange medium return manifold attached to each heat exchange medium exit nozzle of each flat plate heat exchanger coil, said heat exchange medium return manifold attached to a vacuum source so as to draw a quantity of heat exchange medium from the supply thereof through each flat plate heat exchanger coil and return the heat exchange medium back to the heat exchange medium supply system.

26. The bulk material heat exchanger of claim 25, further comprising:
at least one support lug extending from one edge of said body.
27. The bulk material heat exchanger of claim 25, further comprising:
at least one indentation formed into one edge of said body.
28. The bulk material heat exchanger of claim 25, further comprising:
at least one lifting lug extending from the top of said body.
29. The bulk material heat exchanger of claim 25, wherein said body includes at least one support hole formed through the side sheets thereof.
30. The bulk material heat exchanger of claim 25, the said body has a thickness that decreases from one transverse edge to the second transverse edge.
31. The bulk material heat exchanger of claim 25, wherein the thickness of the body decreases from one transverse edge to the second transverse edge in a series of steps.

32. The bulk material heat exchanger of claim 25, wherein the series of steps are created by overlapping sections of sheet material to form the two opposing sides thereof.
33. The bulk material heat exchanger of claim 25, wherein the series of steps are created by forming inward facing bends at spaced locations along each side sheet.
34. The bulk material heat exchanger of claim 25, wherein said body has a width that increases from one transverse edge to the second transverse edge.
35. The bulk material heat exchanger of claim 25, further comprising:
at least one removable seal positioned between the sides sheets of two adjacent flat plate coils.
36. The bulk material heat exchanger of claim 25, wherein the flat plate coil includes at least one at least one pressure resistor member positioned within the open interior space with one end thereof attached to the interior surface of one side sheet.
37. The bulk material heat exchanger of claim 25, wherein the flat plate coil includes at least one pressure restraint member positioned within the open interior space.
38. The bulk material heat exchanger of claim 25, further comprising a lift means for lifting each plate coil to aid in the removal of bulk material that has accumulated on the exterior surfaces of the plate coils.

39. A method of automated cleaning of an exterior surface of a plate coil comprising the steps of:
 - providing at least two plate coils arranged side-by-side in a spaced relationship, wherein the plate coils include a heat exchange medium inlet nozzle and an exit nozzle;
 - attaching the heat exchange medium inlet and exit nozzles to a heat exchange medium supply system, wherein the supply system includes a vacuum source which is attached to the heat exchange medium exit nozzles for creating a negative operating pressure within the plate coils;
 - isolating the vacuum source allowing the heat exchange medium to develop a predetermined desired hydrostatic pressure within the plate coils to slightly inflate the plate coils to reduce the space between the plate coils and compress any bulk material which is accumulated on the exterior surfaces of the sides of the plate coils; and
 - reconnecting the vacuum source to reestablish the negative operating pressure and thus deflating the plate coils to increase the space between the coils and dislodge the compressed bulk material.
40. The method of claim 39, further comprising the step of:
 - connecting a pulsing system between the vacuum source and the exit nozzles of the plate coils to isolate the vacuum source and reconnect the vacuum source in a cyclic manner having a predetermined frequency.
41. A method of automated cleaning of an exterior surface of a plate coil comprising the steps of:
 - providing at least two plate coils arranged side-by-side in a spaced relationship, wherein the plate coils are supported by a support bar having the ends thereof supported by supports;

attaching a lift means for lifting the support bar off of the supports to the ends of the support bar;

raising the support bar and supported coils by the lift means a predetermined distance off of the supports;

dropping the support bar under the force of gravity the predetermined raised distance onto the supports to send a shock wave through the coils to dislodge bulk material which has accumulated on the exterior surfaces of the coils.

42. A method of automated cleaning of the exterior surfaces of adjacent plate coils comprising the steps of:
 - providing at least two plate coils arranged side-by-side in a spaced relationship, wherein each plate coil is supported on a cam attached to a support bar and wherein a support sleeve of the plate coil includes a cam follower which is in contact with the profile of the cam; and
 - rotating the support bar so that the cam follower of each plate coil follows the profile of the cam which it is engaged so that the plate coil is raised and lowered in accordance with the profile of the cam so as to remove material that has accumulated on the exterior surfaces of the plate coil.
43. The method of claim 41, wherein the maximum lift of each cam is offset by a predetermined number of degrees so that each plate coil is raised and lowered in a predetermined sequential pattern so as to create a shearing effect of the material between the adjacent plate coils.
44. The method of claim 43, wherein the profile of the cam includes a steep section so that the plate coil is caused to fall under the force of gravity a predetermined distance in accordance with the steep section of the cam profile

so that a shock wave is sent through the plate coil to aid in the removal of the material.

44. The method of claim 42, wherein the sleeve includes a scraper element for removing material debris along the surface of the cam so as to keep the surface of the cam free of material that would otherwise impede the operation of the cam.